

KEY

Directions: Read each item carefully.

- If you are given blanks, **FILL THEM IN.** If you are given choices, **CIRCLE** the best one.
- You may use your textbook, notebook, or other reliable sources to get the correct answers.
- You are responsible for making sure your answers are correct.
- The exam is 100 items and covers the same material as this review.
- The exam will be **multiple choice**.

***You must turn your completed review the day OF THE EXAM, BEFORE taking the exam. You can still keep your copy to study from the night before you take the exam.**

- **→It will be part of your exam grade.**
- **This is the last work for you to do except the final exam.**

1. What is "Physical Science"? Study of physical world + universe
2. What are the 2 main branches of physical science? Physics + Chemistry (+ Earth / Space)
3. Does physical science include biology (or the study of living things)? No.
4. Whose teachings were considered law by the Roman Catholic Church for about 2,000 years?
A Newton B Einstein C Aristotle D Galileo E Heisenberg
5. List the steps of the scientific method in the correct order.
1) Ask a question.
2) Do research
3) Construct Hypothesis (Educated Prediction)
4) Experiment - Test Hypothesis (Collect Data)
5) Analyze Data 6) Draw Conclusions or Revise + Re-test
7) Communicate Results
6. What do we call an educated PREDICTION in science? Hypothesis
7. If data from an experiment shows that a **hypothesis is wrong**, what does a scientist do next?
A The scientist gives up and starts an investigation on a new topic.
B The data must be incorrect and are thrown out.
C The hypothesis is revised.
D The data are altered so that they support the original hypothesis.
8. On the Celsius scale, at what temperature does water boil? 100° And freeze? 0°
9. On the Fahrenheit scale, at what temperature does water boil? 212 And freeze? 32
10. What does the prefix "kilo" mean in the metric system? thousand (1,000)
11. How many cm are in 1 meter? 100
12. How many milligrams are in 1 gram? 1,000
13. How many meters are in a kilometer? 1,000

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14. What is the base unit of mass in the metric system? gram
15. Whose teachings were considered law by the Roman Catholic Church for about 2,000 years?
 A Newton B Einstein C Aristotle D Galileo E Heisenberg
16. Who first discovered the principle behind Newton's 1st Law?
 A Newton B Einstein C Aristotle D Galileo E Heisenberg
17. Define the 4 states of matter, and give an example of each:

Ice a. Solid Fixed shape + volume

Water b. Liquid Fixed volume; takes shape of container.

steam c. Gas No fixed shape or volume. Takes shape + volume of container

d. Plasma Ionized gas. + or -. Rare on earth, but 99% of universe. STARS are plasma. Also Neon lights + fluorescent lights.

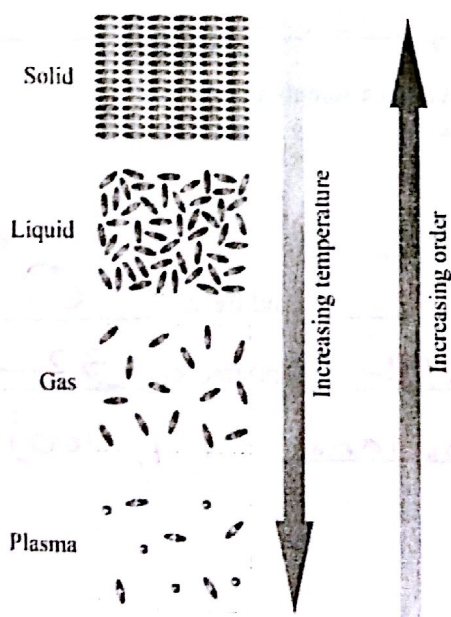
18. Which state of matter has the most energetic particles? PLASMA

19. Which states of matter have no definite shape? Liquid, Gas, & Plasma

20. Which state of matter is created by lightning? Plasma

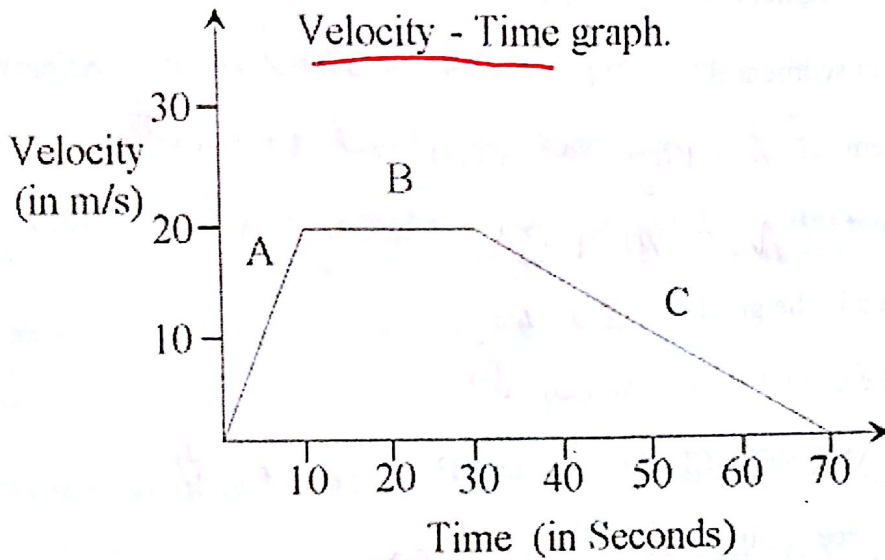
21. If you add heat energy to a substance, water for example, what happens to the speed of the particle motion?

INCREASES



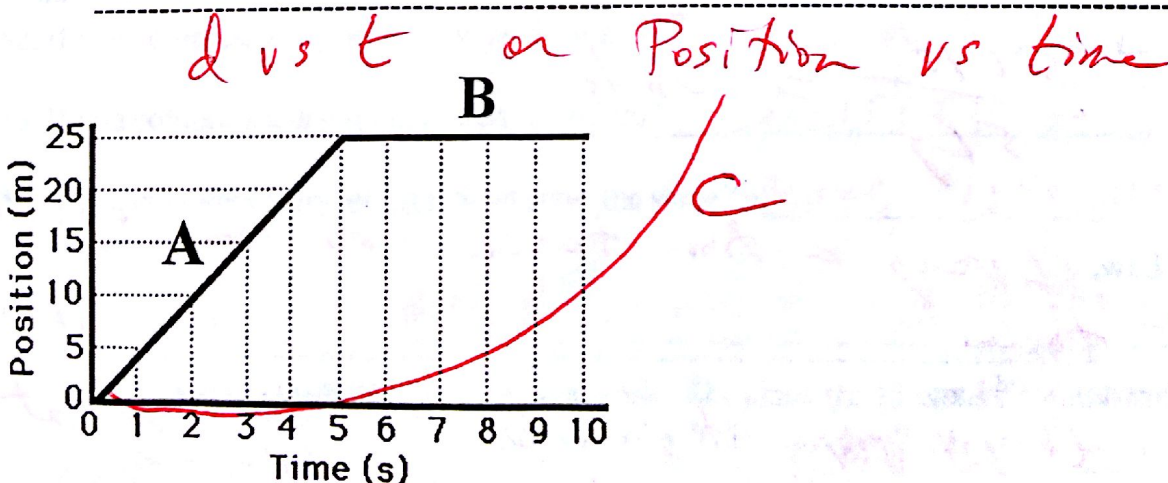
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22. Describe the differences in the 4 states of matter. Use the diagram shown above to help you.



Using the velocity-time graph shown above, describe:

- A) What the object is DOING in segment A: *Increasing speed (velocity)*
- B) What the object is DOING in segment B: *Going constant velocity*
- C) What the object is DOING in segment C: *Decreasing speed*
- D) How much time does the whole trip take? *70 seconds*
- E) How fast is the object going in segment B? *20 m/s*
- F) How much time does segment C take? *40 seconds*
- G) By how much does the speed increase in segment A? *20 m/s (0 to 20 m/s)*



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On the DISTANCE vs TIME (or Position vs Time) graph shown above:

23. How much DISTANCE is covered in segment A? *25 m*
24. How much DISTANCE is covered in segment B? *0 m (sitting still)*
25. What is the object DOING in segment A? *Moving at constant velocity*
26. What is the object DOING in segment B? *Not moving. Sitting still.*
27. What is the TOTAL distance traveled in the graph? *25 m*
28. What is the TOTAL time taken in the graph? *10 seconds*
29. Where is the object going a CONSTANT VELOCITY greater than 0? *Segment A*
30. A) Is the object ever accelerating or decelerating? *No, neither.*

B) If the object WERE picking up speed on a position (or distance) vs. time graph, what would it look like on this graph? **DRAW IT IN AND LABEL IT "C"**.

31. Define Newton's 1st Law. *An object at rest tends to stay at rest. An object in motion in a straight line tends to continue in motion at constant velocity. (Property of Inertia)*
32. Give an example of Newton's 1st Law. *Asteroid in outer space tends to keep moving.*

33. Define Newton's 2nd Law.

$F = ma$ $a = F/m$ Acceleration is directly prop. to Net F & inversely proportional to mass.

34. Give an example of Newton's 2nd Law.

If you pull a wagon harder, it accelerates more.

35. A net force of 50 N pulls a 5 kg wagon. How fast does the wagon accelerate? Show your work with all units!

$$a = F/m = \frac{50 \text{ N}}{5 \text{ kg}} = 10 \text{ m/s}^2$$

36. Define Newton's 3rd Law.

Every action force has an equal & opposite reaction force.

37. Give an example of Newton's 3rd Law.

You hit the wall w/ 80 N, it hits back with 80 N at same time. Action/Reaction pair.

38. Galileo was the person to originally figure out the principle behind Newton's 1st Law. What happened to him so that he could not publish his ideas?

Inquisition - made him recant. Called him heretic. Put him in house arrest.

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39. Your hand hits a brick wall. The brick wall hits you back with THE SAME force.

40. If the action force is bat hits ball, the reaction force is: BALL HITS BAT

41. Which of the following universal forces is the weakest, but acts over the greatest distances?
A electric B gravitational C magnetic D strong nuclear

42. Newton's third law of motion describes
A action and reaction forces. C centripetal forces.
B balanced forces. D net force.

43. As an astronaut travels far away from Earth, what happens to her weight? Decreases

44. MASS is the amount of matter in an object.

45. DENSITY is how tightly packed together the material in an object is.

46. VOLUME is how much space an object takes up.

47. WEIGHT is the pull of gravity on an object.

48. If you took an object to the moon, what would happen to its mass? Stay the same.

49. If you took an object to the moon, what would happen to its weight? Decrease. Less gravity.

50. If D'airius weighs 165 pounds, what is his mass in kg? (Pounds / 2.2 = kg!)
A 363 kg B 163 kg C 75 kg D 2.2 kg $165 / 2.2 = 75 \text{ kg}$

51. Joe weighs 910 N. What is his mass in kg? ($F = ma$ or $Wt = mg$ so $m = Wt / g$ and $g = 10 \text{ m/s}^2$)

Show your work! $Wt = mg \Rightarrow m = Wt / g = 910 \text{ N} / 10 \text{ m/s}^2 = 91 \text{ kg}$

52. If you compress a dry sponge, what decreases? VOLUME

53. If you compress a dry sponge, what increases? DENSITY

54. If you compress a dry sponge, what stays the same? MASS, WEIGHT, INERTIA

55. A change in velocity is Acceleration $a = \Delta v / t$

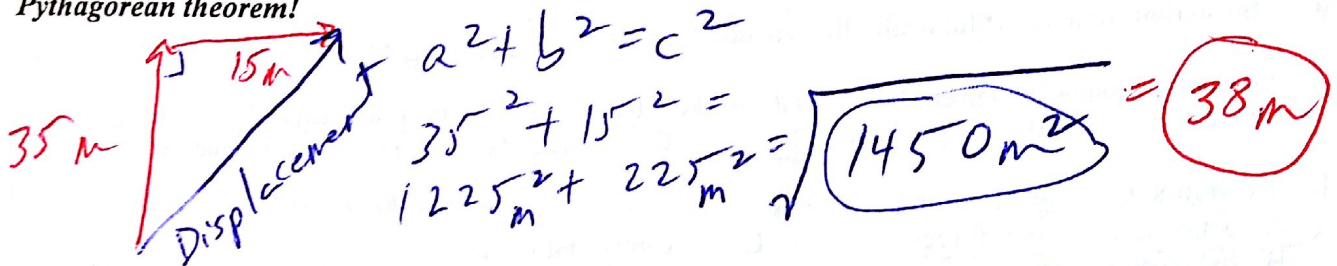
Mary is skipping down the sidewalk. She skips for 35 meters. She turns right & skips 15 more meters. This trip takes 0.2 hours.

56. Show your work. Mary's total distance is $35 \text{ m} + 15 \text{ m} = 50 \text{ m}$

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57. Show your work. Mary's average speed is $\text{speed} = d/t = 50\text{m}/0.2\text{hrs} = 250\text{m/hr}$

58. What is Mary's displacement? Show this on a vector diagram. Label each side of the triangle. Use the Pythagorean theorem!



51. A ball falls off the roof & reaches the ground going 20 m/s. This takes 2 seconds. What is the ball's acceleration? Show the formula, work, & correct unit.

$$a = \Delta v / t = (20\text{m/s} - 0\text{m/s}) / 2\text{s} = 20\text{m/s} / 2\text{s} = 10\text{m/s}^2$$

59. What is the tendency to resist change in motion? INERTIA

60. FRICTION is the force that opposes motion.

61. Write the formula for work. $W = Fd$

62. What is the correct UNIT for work? N.m or J

63. Write the formula for power. $P = W/t$

64. What is the correct UNIT for power? Watt

65. What does POWER measure? LIFTING STRENGTH

RATE OF DOING WORK

66. Which of the following has NOTHING to do with TIME (or how FAST you go)? Work Power

67. Is the statue of liberty doing work by holding her torch in the air? No. No movement

68. What is the SI unit of power? Watt $(W = Fd)$

69. The rate of doing work is Power (in watts)

70. Machines make work easier by requiring less force

71. How many types of simple machines are there? 6

72. Which two simple machines are the MAIN 2 from which ALL OTHER simple machines are made?

a. Lever

b. Inclined plane

73. List the 6 types of simple machines.

Wedge
screw

Wheel + Axle
Pulley

- a. Lever
- b. Wedge
- c. Screw

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- d. Inclined Plane
- e. Wheel & Axle
- f. Pulley

74. If you push a box up an inclined plane, 6 m, instead of lifting it straight up 3 m to the top, what is the ideal mechanical advantage?

6m 3m $IMA = \frac{d_{in}}{d_{out}} = \frac{6m}{3m} = \boxed{2}$

75. If the box in the previous item weighs 20N, how much work do you do if you lift it straight up to a 3m height?

$W = Fd = 20N (3m) = \boxed{60 N \cdot m}$ or J

76. If a bulldozer can do a job in half the time as a person on his own, which does more work? Circle one: (person, bulldozer, same)

$W = Fd$ (time not a factor)

77. Given the situation above, which produces more power? (person, bulldozer, same)

$P = W/t$

78. Two people jump off a cliff into the lake. Jake is heavier than Joe. Who hits the ground first?

(Jake, Joe, same)

$a = 10m/s^2$

$a = F/m = \frac{F}{m}$

$\frac{F}{m}$

79. Given the situation above, who did more work? (Jake, Joe, same)

$W = Fd$

80. Given the situation above, who had more power? (Jake, Joe, same)

$P = W/t = (F/d)/t$

81. The energy of motion is KINETIC energy.

Gravitational
POTENTIAL

82. You walk to the top of a flight of stairs & stand still. What kind of energy do you have? POTENTIAL

83. When you make several trips to unload a few heavy items from a car instead of moving them all at once, the total distance over which you exert yourself increases (b). The total FORCE you have to use while you are carrying the items decreases (c). The total amount of ENERGY you use to complete the job stays the SAME (d).

- b. Increases
c. Decreases
d. Stays the Same

} Each choice used only once

***Each choices is used only ONCE in the 3 blanks for this question.

84. The formula for gravitational potential energy is: PE = mgh

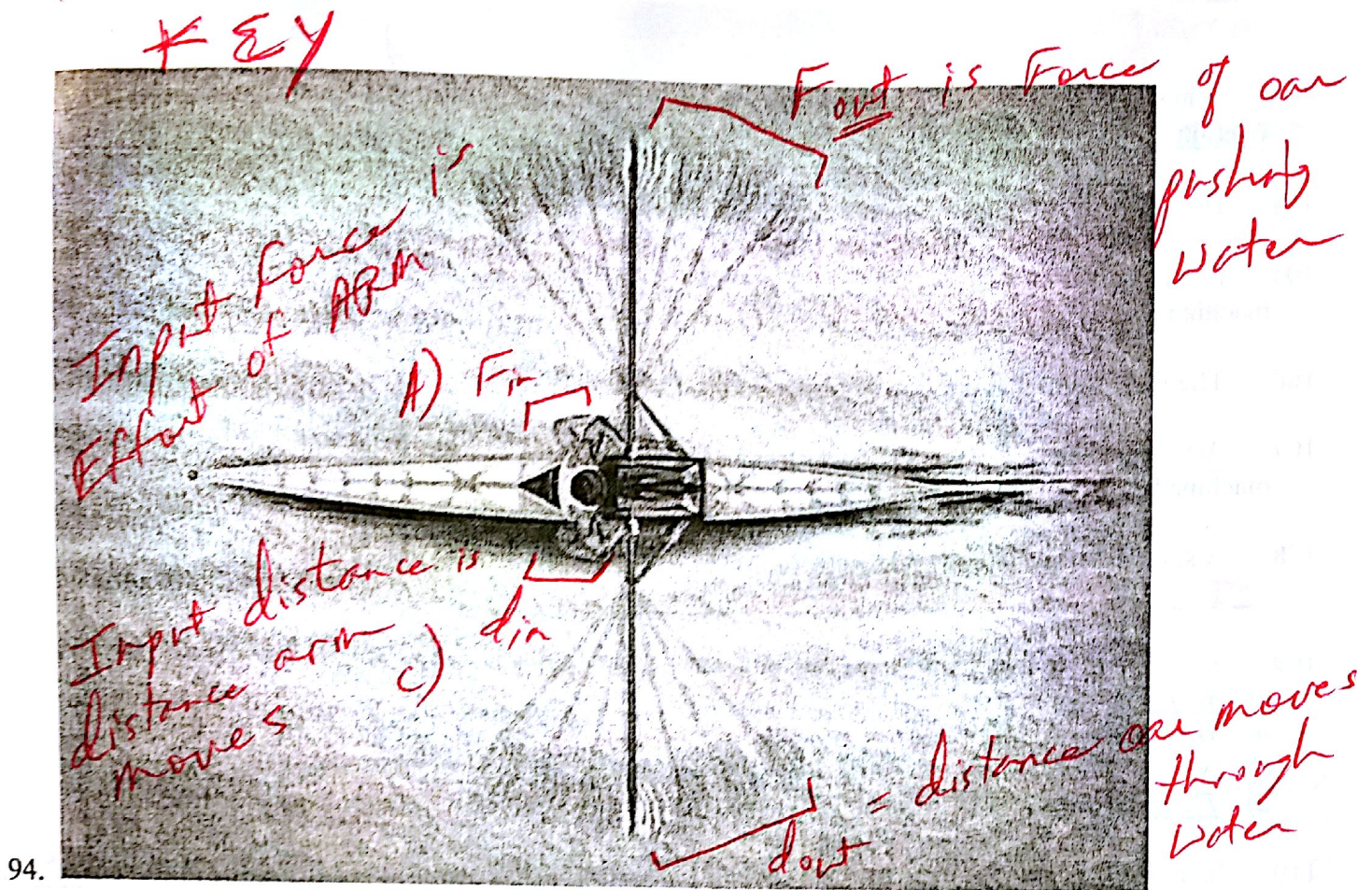
85. Looking at the formula for Gravitational Potential Energy, what are the THREE things that affect an object's gravitational PE? 1) mass 2) acceleration 3) height (vertical distance)

86. In addition to gravitational potential (STORED) energy due to a vertical height above some reference level (like a table top, the floor, or sea level), there are other types of stored or potential energy. Explain why these are all potential energy:

They are all stored energy - the potential to do work.

- KEY**
- e. **Chemical Potential energy** stored in a battery
 - f. **Chemical Potential energy** stored in food and fossil fuels in the Carbon bonds between atoms
 - g. **Elastic or Spring Potential energy**, stored in materials like a stretched rubber band, a pulled bow string, a compressed shock absorber, a stretched net, or a trampoline.

87. Energy is measured in units of Joules (or N.m).
88. A drawback of solar energy is that it depends on weather (sunshine).
89. Which of the following increases when an object becomes warmer?
A chemical energy C nuclear energy
B elastic potential energy D thermal energy
90. The unit for work is Joule (or N.m).
91. The ability to do work is ENERGY.
92. In real life, the work done by a machine is always less than the work done on a machine because of FRICTION.
93. The work done "by" a machine is referring to the work: INPUT OUTPUT (circle one)



94.

On the above machine, LABEL: a) Input Force, b) Output Force, c) Input Distance, d) Output Distance

95. How many WATTS are equal to 1 horsepower? 746 W = 1 hp.

96. The acceleration due to gravity of all objects is 10 m/s^2 on Earth.

97. Write the formula for kinetic energy. $KE = \frac{1}{2}mv^2$

98. Energy that travels through space in the form of waves is electromagnetic energy.

99. What is Mechanical Advantage? $MA = d_{in}/d_{out}$ or F_{out}/F_{in} . It is

the number of times a machine multiplies Effort Force (or Input F.)

100. Give an example of Mechanical Advantage.

A person can lift a car using a jack by having a large input distance. Jack multiplies the person's input force.

101. What is the difference between Ideal (or Theoretical) and Actual (or Real) Mechanical Advantage?

Actual is with FRICTION. Ideal ignores Friction.

102. Greater input force is required to move an object along a ramp with a rough surface, compared to a ramp with a smooth surface, because a greater force is needed to overcome: FRICTION.

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103. A machine's Ideal mechanical advantage is the mechanical advantage in the absence of friction.

104. How does friction always affect a car's fuel efficiency? Air friction. More air resistance means lower gas mileage.

105. A screwdriver used to pry the lid off a paint can is an example of what simple machine? Lever

106. The fixed point that a lever rotates around is called the Fulcrum.

107. A Wedge, Ramp, Screw, and Staircase are all types of what MAIN simple machine? Inclined PLANE

108. A slanted surface along which a force moves an object to a different elevation is called a(n): Inclined Plane

109. The ideal mechanical advantage of a pulley or pulley system is equal to the:

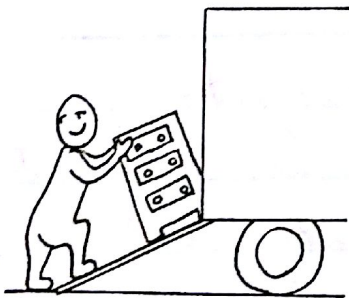
- a) Weight of the load
- b) Distance the load is lifted
- c) Number of rope sections supporting the load being lifted
- d) Force input

110. In an ideal system (or machine), you get ALL the energy OUT that you had to put IN. This is 100% efficiency, and NEVER happens in real life because of friction.

111. How much work is done if a 700 N person climbs stairs to attain a vertical distance (or height) of 3 m?

$$W = Fd = 700\text{ N} (3\text{ m}) = 2100\text{ N}\cdot\text{m or J}$$

112. How much POWER is used if a 700 N person climbs stairs to attain a vertical distance (or height) of 3 m in 10 seconds?



$$P = \frac{W}{t} = \frac{Fd}{t} = \frac{2100\text{ N}\cdot\text{m}}{10\text{ s}} =$$

$$210\text{ J/s or Watts}$$

113.

a) What type simple machine is shown above, helping the person move furniture into a truck?

Inclined Plane

b) If the chest of drawers weighs 20 N, and the moving truck floor is 2 m off the ground, how much WORK (or ENERGY) does the person use if he lifts the furniture straight up? (Show your work!)

$$W = Fd = 20\text{ N} (2\text{ m}) = 40\text{ N}\cdot\text{m or J}$$

c) How much work or energy does he use with the ramp-- MORE LESS THE SAME

No machine allows you to use less work or energy. Only less Force.

- d) By using the ramp, does he use MORE LESS or THE SAME Force as he does when picking the chest straight up?
- e) If the ramp is 4 m long (*twice the distance as picking it straight up*), how much FORCE does he use? (*Show your work!*)

Twice the distance means HALF the Force. $20\text{N}/2 = 10\text{N}$

114. What is a compound machine?

Two or more single machines working together

115. Give 3 examples of compound machines.

h. 1) *Watch*

i. 2) *Car*

j. 3) *Lawn Mower*

116. After the Inquisition, Galileo was

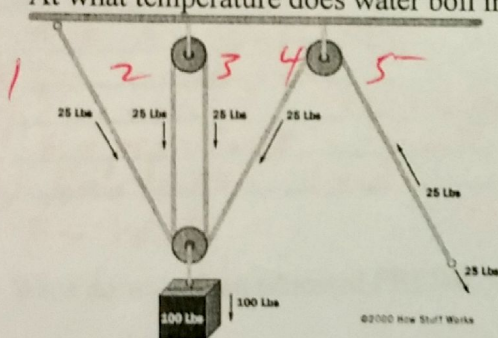
A sentenced to house arrest

B burned at the stake

C excommunicated (banished)

D beheaded

117. At what temperature does water boil in degrees F? 212° In degrees Celcius? 100°



118.

a) How do you determine the mechanical advantage of a PULLEY system? *Count the number of strands supporting the load.*

b) What is the Mechanical Advantage of the pulley in the above diagram? 4
EXPLAIN: How do you know?

4 strands supporting LOAD. other strand changes directions.

Bonus: Draw a cartoon showing something you have learned in physical science. Include an explanation!